

CLAIMS

1. A hinge and locking assembly comprising
a pair of support members rotatable relative to each other about a
5 common axis, each support member having at least one locking slot,
a lock having at least one locking tab configured for receipt in the
locking slots in the support members to block relative movement of the support
members relative to each other, and
a lifting cam configured to move the lock relative to the support
10 members to selectively disengage the locking tab from the locking slots in the support
members to permit relative movement of the support members relative to each other.
2. The hinge and locking assembly of claim 1, wherein the lock is
rotatable about the common axis.
3. The hinge and locking assembly of claim 1, wherein the lifting
15 cam is rotatable about the common axis.
4. The hinge and locking assembly of claim 1, wherein both the
lock and the lifting cam are rotatable about the common axis.
5. The hinge and locking assembly of claim 4, further including a
drive shaft rotatable about the common axis, wherein the lifting cam is coupled to the
20 drive shaft for rotation therewith.
6. The hinge and locking assembly of claim 5, wherein the lock is
coupled to the drive shaft for axial movement toward and away from the support
members.
7. The hinge and locking assembly of claim 6, wherein the lock
25 has a pair of axially-extending locking tabs which are spaced at equal radial distances
from the common axis on the opposite sides thereof along a line that extends through
the common axis.
8. The hinge and locking assembly of claim 7, wherein a first one
of the support members has a pair of axially-extending locking slots which are spaced
30 at equal radial distances from the common axis on the opposite sides thereof along a
line that extends through the common axis, and wherein a second one of the support
members has a first pair of axially-extending locking slots which are spaced at equal

radial distances from the common axis on the opposite sides thereof along a line that extends through the common axis so that the locking tabs of the lock can extend through the pair of locking slots in the first support member and the first pair of locking slots in the second support member in a first configuration of the support
5 members.

9. The hinge and locking assembly of claim 8, wherein the second support member has a second pair of axially-extending locking slots which are spaced at equal radial distances from the common axis on the opposite sides thereof along a line that extends through the common axis so that the locking tabs of the lock can
10 extend through the pair of locking slots in the first support member and the second pair of locking slots in the second support member in a second configuration of the support members.

10. The hinge and locking assembly of claim 9, wherein the first and second pairs of axially-extending locking slots in the second support member are
15 arranged to form an acute angle relative to each other.

11. The hinge and locking assembly of claim 9, further including a spring for biasing the lock toward the support members to urge the locking tabs to extend through the locking slots in the support members.

12. The hinge and locking assembly of claim 9, wherein the
20 locking tabs of the lock extend through the first pair of locking slots in the second support member in a collapsed configuration of the support members.

13. The hinge and locking assembly of claim 12, wherein the locking tabs of the lock extend through the first pair of locking slots in the second support member in an extension ladder configuration of the support members in
25 addition to the collapsed configuration of the support members.

14. The hinge and locking assembly of claim 9, wherein the locking tabs of the lock extend through the second pair of locking slots in the second support member in a step ladder configuration of the support members.

15. The hinge and locking assembly of claim 9, further including a
30 knob configured to be coupled to the drive shaft to cause rotation of the drive shaft.

16. The hinge and locking assembly of claim 9, wherein lifting cam has three lobes and three cutouts between the lobes, and wherein each lobe and each

cutout forms a 60° angle at the common axis so that the lifting cam alternately moves the lock toward and away from the support members with each 60° rotation thereof.

17. The hinge and locking assembly of claim 16, further including a counter rotation locking mechanism to allow rotation of the drive shaft about the
5 common axis only in a first direction, and to block rotation of the drive shaft about the common axis in a second opposite direction.

18. The hinge and locking assembly of claim 17, wherein the counter rotation locking mechanism includes a locking member coupled to one of the support members for rotation therewith and a detent member coupled to the drive
10 shaft for rotation therewith.

19. The hinge and locking assembly of claim 18, wherein the locking member has six tabs and six cutouts between the tabs, and wherein each tab and each cutout in the locking member forms a 30° angle at the common axis.

20. The hinge and locking assembly of claim 19, wherein the
15 detent member has three peripheral detents spaced 120° apart.

21. The hinge and locking assembly of claim 9, wherein the locking slots are radially extending.

22. The hinge and locking assembly of claim 9, wherein the locking slots are peripherally spaced.

20 23. The hinge and locking assembly of claim 9, wherein the locking slots are rectangular.

24. The hinge and locking assembly of claim 9, wherein the locking slots are square.

25 25. The hinge and locking assembly of claim 9, wherein the locking slots are circular.

26. The hinge and locking assembly of claim 13, further including front and rear outer covers configured to prevent rotation of the support members beyond the extension ladder configuration.

27. A locking hinge apparatus comprising
first and second hinge members coupled together for rotation about an
axis,

5 a lock movable between a locking position in which the first and
second hinge members are prevented from rotating about the axis and a releasing
position in which the first and second hinge members are permitted to rotate about the
axis, and

a knob rotatable about the axis and movable along the axis, the lock
moving from the locking position to the releasing position in response to movement
10 of the knob axially toward the first and second hinge members and then rotation of the
knob about the axis.

28. The locking hinge apparatus of claim 27, wherein the lock is
movable axially along the axis relative to the hinge members between the locking and
releasing positions.

15 29. The locking hinge apparatus of claim 28, comprising a lifting
cam configured to move the lock between the locking and releasing positions.

30. The locking hinge apparatus of claim 29, wherein the lifting
cam is rotatable about the axis.

20 31. The locking hinge apparatus of claim 30, comprising a drive
shaft rotatable about the axis, wherein the first and second hinge members and the
lock are rotatably mounted on the drive shaft, and wherein the lifting cam and the
knob are mounted on the drive shaft for rotation therewith.

25 32. The locking hinge apparatus of claim 31, wherein each hinge
member has at least one locking slot, and wherein the lock has at least one locking tab
configured for receipt in the locking slots in the hinge members to block relative
movement of the hinge members relative to each other.

30 33. The locking hinge apparatus of claim 32, further comprising a
locking member coupled to one of the hinge members for rotation therewith and a
detent member coupled to the drive shaft for rotation therewith, wherein the locking
and detent members cooperate with each other to allow rotation of the drive shaft in a
first direction, and to block rotation of the drive shaft in a second opposite direction.

34. A locking hinge apparatus comprising
first and second hinge members coupled together for rotation about an
axis,

5 a lock movable between a locking position in which the hinge
members are prevented from rotating about the axis and a releasing position in which
the hinge members are permitted to rotate about the axis, and
means for moving the lock from the locking position to the releasing
position.

10 35. The locking hinge apparatus of claim 34, wherein the moving
means comprises a knob rotatable about the axis and movable along the axis, the lock
moving from the locking position to the releasing position in response to movement
of the knob axially toward the hinge members and then rotation of the knob about the
axis.

15 36. The locking hinge apparatus of claim 35, further comprising a
cam rotatable about the axis in response to rotation of the knob about the axis to move
the lock between the locking and releasing positions.

37. The locking hinge apparatus of claim 35, wherein the lock is
movable axially along the axis from the locking position to an intermediate position in
response to axial movement of the knob toward the hinge members.

20 38. The locking hinge apparatus of claim 37, further comprising a
lock support pin movable axially along the axis in response to axial movement of the
knob, wherein the lock is mounted on the lock support pin for axial movement
therewith so that the lock moves from the locking position to the intermediate position
in response to axial movement of the knob toward the hinge members.

25 39. The locking hinge apparatus of claim 37, further comprising a
cam rotatable about the axis in response to rotation of the knob about the axis,
wherein the cam is prevented from rotating about the axis when the lock is in the
locking position and the cam is permitted to rotate about the axis when the lock is in
the intermediate position.

30 40. The locking hinge apparatus of claim 39, wherein the lock
moves from the locking position to the intermediate position in response to axial
movement of the knob toward the hinge members, and the lock moves from the

intermediate position to the releasing position in response to rotation of the knob about the axis.

41. The locking hinge apparatus of claim 40, further comprising a drive shaft rotatable about the axis, wherein the hinge members and the lock are rotatably mounted on the drive shaft, and wherein the cam and the knob are mounted on the drive shaft for rotation therewith.

42. The locking hinge apparatus of claim 41, wherein each hinge member has at least one locking slot, and wherein the lock has at least one locking tab configured for receipt in the locking slots in the hinge members to block relative movement of the hinge members relative to each other.

43. The locking hinge apparatus of claim 42, further comprising a locking member coupled to one of the hinge members for rotation therewith and a detent member coupled to the drive shaft for rotation therewith, wherein the locking and detent members cooperate with each other to allow rotation of the drive shaft in a first direction, and to block rotation of the drive shaft in a second opposite direction.